

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN OR RELATING TO ELECTRICAL TERMINALS

(71) We, GROTE & HARTMANN of 56 Wuppertal-Ronsdorf, Am Kraftwerk 13, German Federal Republic, a Kommanditgesellschaft organised under the laws of the German Federal Republic, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a connecting terminal for a flat electrical conductor of a tape cable, and to a method of and apparatus for connecting the terminal to such a conductor.

A known connecting terminal for a tape cable with an insulated conductor has teeth which penetrate the conductor insulation and provide an electrical connection. The teeth penetrate right through the insulation and are then bent over to effect a mechanical as well as electrical connection between the conductor and the terminal, the electrical connection being dependent to an appreciable degree on the strength of the anchoring.

According to a first aspect of the present invention, there is provided a connecting terminal for a flat electrical conductor of a tape cable, comprising a stamped metal member having an elongate base portion and two arms so respectively extending from the longitudinal edges of the base portion that the member is of substantially U-shaped section, at least one ridge being impressed in the base portion to extend transversely thereof between the arms and defining a knife edge at its crest.

Preferably, each of the arms is provided at its free end with a knife edge, which may be formed with undulations or with serrations.

According to a second aspect of the present invention, there is provided a method of connecting a terminal as provided by

the invention to a flat electrical conductor, comprising the steps of disposing the conductor on the base portion of the terminal between the arms thereof, rolling the arms inwardly towards the ridge or ridges of the base portion at least until the arms contact the conductor at their free ends and then so bending the longitudinal edges of the base portion away from the conductor as to cause the arms to exert a turning moment on the conductor.

Preferably, when the conductor is insulated, the arms of the terminal are rolled at least until they penetrate the insulation and contact the conductor.

Preferably, also the longitudinal edges of the base portion are so bent away from the conductor as to form at each longitudinal edge an arcuate portion having a smaller radius of curvature than that of each of the rolled arms.

According to a third aspect of the present invention, there is provided apparatus for carrying out the method provided by the invention, comprising a first die provided with a pair of arcuate recesses to shape the arms of the terminal and a second die provided with a pair of arcuate recesses to shape the longitudinal edge portions of the base portion of the terminal, the radius of curvature of the recesses of the first die being greater than that of the recesses of the second die.

In connection of a terminal embodying the present invention to a tape cable with one or more flat conductors embedded in insulating material, on crimping over the arms, which have penetrated the insulation in which the conductor is embedded, the free ends of the arms press the conductor against the crest of the or each ridge. The free ends of the arms and the crest of the or each ridge penetrate the insulation on opposite sides of the conductor and thereby provide a reliable electrical con-

nection of the parts. Due to the transverse extension of the ridge, the thus created electrical connection is also relatively insensitive to loading of the conductor in tension.

Embodiments of the present invention will now be more particularly described by way of example with reference to the accompanying drawings, of which:—

Fig. 1 is a cross-sectional end view of a connecting terminal embodying the first aspect of the invention:

Fig. 2 is a cross-sectional view on the line II-II of Fig. 1;

Fig. 3 is a schematic end view, to an enlarged scale, of the terminal before and after connection to a conductor; and

Fig. 4 is a schematic end view of apparatus embodying the third aspect of the invention.

Referring now to the drawings, there is shown in Figs. 1 to 3 a connecting terminal comprising a stamped metal member having a base portion 3 with arms 4 bent up at the longitudinal edges thereof. In addition, the terminal has a connecting lug or the like (not shown).

As can be seen in Figs. 1 and 2 of the drawings, substantially prismatic ridges 31, which extend transversely of the base portion 3, are impressed from the outside into the base portion 3. Crests 32 of the ridges 31 are shaped to define a knife edge and are able to penetrate — when the terminal is to be connected to an insulated flat electrical conductor — the insulation of the conductor. The rigidity of the connecting terminal is enhanced by the impressed ridges 31, so that thin sheet metal can be employed for manufacture of the terminal. At least one ridge 31 is to be provided, the electrical connection to the conductor as well as the rigidity of the terminal being improved with greater numbers of ridges.

The free ends of the arms 4 each have a knife-edge 41, which can be formed to be undulating or serrated in the longitudinal direction of the arms 4.

An impression 42 adjacent the free end portion of each of the arms 4 facilitates rolling-in or crimping of the arms during the connecting process.

For connecting the terminal to an insulated flat conductor 5 in accordance with a method exemplifying the present invention, as shown in Fig. 3 the conductor 5 is disposed on the base portion and the arms 4 are rolled inwardly until the knife-edges 41 contact the conductor 5. The rolling can be carried out to the extent that the knife-edges 41 penetrate into the conductor 5 (Fig. 3) or right through the conductor. The base portion 3 is then bent downwardly on both sides in the shape of a circular arc until the knife-edges 41 exert

a turning moment on the conductor. To this end, it is particularly advantageous, if the radius of curvature of each of the longitudinal edge portions 33 and 34 of the base portion, when bent in the shape of a circular arc, is smaller than the radius of curvature of arcuate portions 43 and 44 of the rolled arms. This ensures that the knife-edges 41 resiliently apply a turning moment to the conductor 5, so as to resiliently retain the conductor 5.

The method is preferably carried out in a nailing apparatus comprising a nailing tool with an upper die 6 having a pair of arcuate recesses 61 and 62 and with a lower die 7 having a pair of arcuate recesses 71 and 72, the radius of curvature of the recesses 61 and 62 being larger than that of the recesses 71 and 72. It may be advantageous if side walls 63 and 64 of the die 6, and edges 73 and 74 of the die 7, are so formed that the external surfaces of the arms 4 of the terminal can slide in the tool without deformation or jaggling in the region of the transition between the edges 73 and 74 and the walls 63 and 64.

The embodiment of a connecting terminal hereinbefore described is relatively strong and simple to manufacture, and provides a satisfactory electrical connection. The method of connecting this terminal to a flat conductor enables resilient retention of the conductor by the terminal.

WHAT WE CLAIM IS:—

1. A connecting terminal for a flat electrical conductor of a tape cable, comprising a stamped metal member having an elongate base portion and two arms so respectively extending from the longitudinal edges of the base portion that the member is of substantially U-shaped section, at least one ridge being impressed in the base portion to extend transversely thereof between the arms and defining a knife edge at its crest.

2. A terminal as claimed in claim 1, wherein each of the arms is provided at its free end with a knife edge.

3. A terminal as claimed in claim 2, wherein the knife edge of each arm is formed with undulations.

4. A terminal as claimed in claim 2, wherein the knife edge of each arm is formed with serrations.

5. A connecting terminal for a flat electrical conductor of a tape cable, substantially as hereinbefore described with reference to Figs. 1 and 2 of the accompanying drawings.

6. A method of connecting a terminal as claimed in any one of claims 1 to 5 to a flat electrical conductor of a tape cable, comprising the steps of disposing the conductor on the base portion of the terminal between the arms thereof, rolling the arms

inwardly towards the ridge or ridges of the base portion at least until the arms contact the conductor at their free ends and then so bending the longitudinal edges of the base portion away from the conductor as to cause the arms to exert a turning moment on the conductor.

7. A method as claimed in claim 6, wherein the conductor is insulated and the arms of the terminal are rolled at least until they penetrate the insulation and contact the conductor.

8. A method as claimed in either claim 6 or claim 7, wherein the longitudinal edges of the base portion are so bent away from the conductor as to form at each longitudinal edge an arcuate portion having a smaller radius of curvature than that of each of the rolled arms.

9. A method as claimed in any of claims 6 to 8, substantially as hereinbefore described with reference to Fig. 3 of the

accompanying drawings.

10. Apparatus for carrying out the method claimed in any one of claims 6 to 9, comprising a first die provided with a pair of arcuate recesses to shape the arms of the terminal and a second die provided with a pair of arcuate recesses to shape the longitudinal edge portions of the base portion of the terminal, the radius of curvature of the recesses of the first die being greater than that of the recesses of the second die.

11. Apparatus as claimed in claim 10, substantially as hereinbefore described with reference to Fig. 4 of the accompanying drawings.

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COMPLETE SPECIFICATION

2 SHEETS

*This drawing is a reproduction of
the Original on a reduced scale*

Sheet 1

FIG.1.

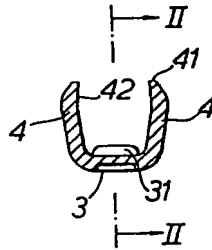


FIG.2.

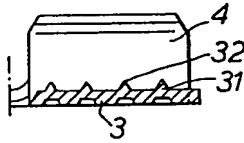


FIG.3.

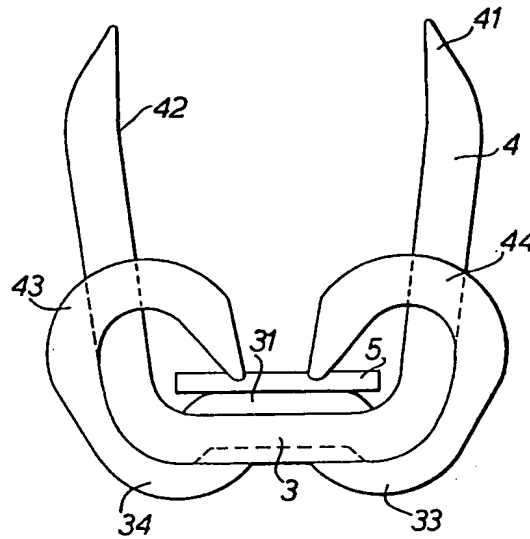
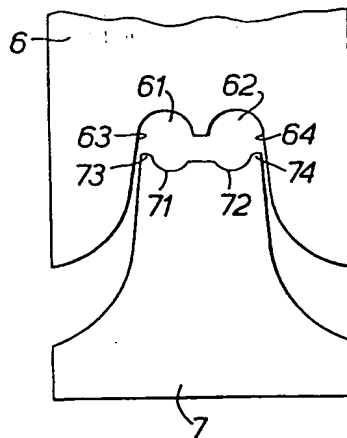


FIG.4.



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